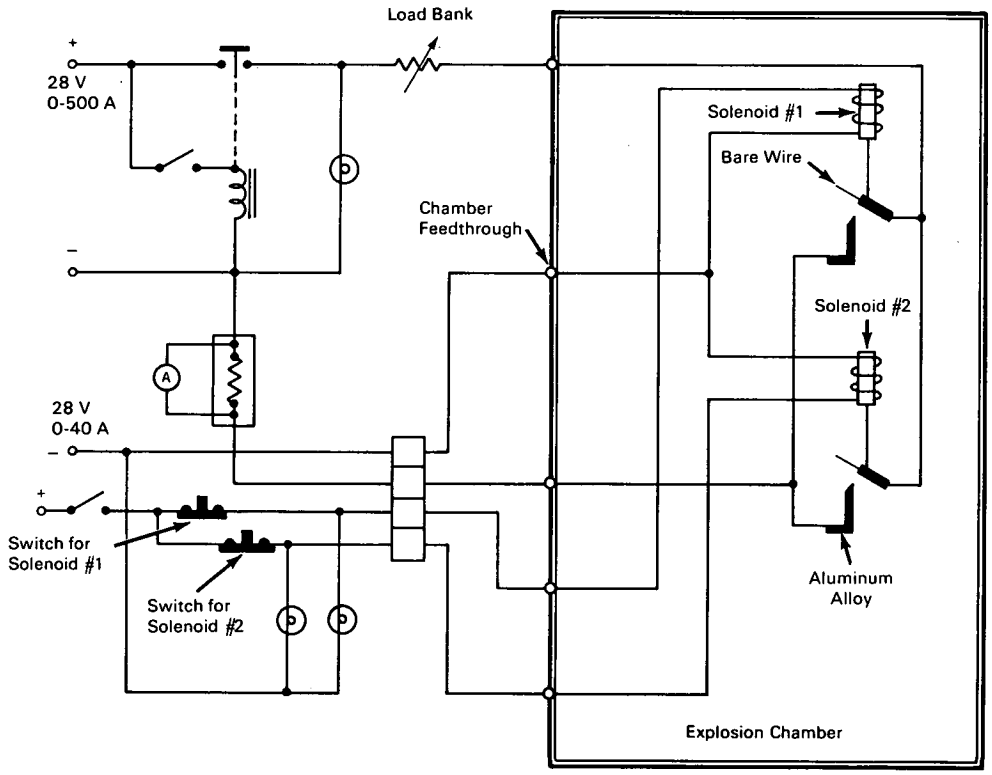
NASA TECH BRIEF

Testing the Flammability of Materials Exposed to Arcs



An apparatus was designed and put to use for testing the flammability and other ignition characteristics of materials in close proximity to incandescent metal fragments or spalls ejected from intermittent short-circuit arcs in air or oxygen-rich atmospheres. This apparatus simulates an actual situation where an exposed "live" wire in an accidentally damaged cable or harness makes intermittent contact with a grounded structural member in areas containing organic materials near the point of contact. The test apparatus produces the desired arcing condition by rapidly shorting a live wire (e.g., no. 12 AWG), carrying a current from a 28 V, 0-500 A dc source, against a grounded aluminum alloy angle. The material to be tested is placed at various distances from the arcing device, consisting of a solenoid actuator, wire, and aluminum

(continued overleaf)

alloy angle, in an environmental chamber in which a controlled oxidizing atmosphere can be maintained. Leads from remotely switched electrical power sources, which are sealed into insulated feedthroughs in the chamber wall, are connected to the arcing device in the chamber.

As shown in the schematic, the solenoid is used to raise and lower the bared live wire relative to the aluminum alloy shorting angle. Energization of the solenoid is controlled by a normally closed pushbutton switch. In the normally closed position the solenoid is energized (from the 28 V dc source), holding the wire away from the shorting angle. To run a test, high-current power is switched on and the pushbutton is depressed, thus deenergizing the solenoid and allowing the wire to drop onto the shorting angle where arcing and spalling occur. The short circuit is removed when the pushbutton is released to reenergize the solenoid. As seen from the schematic, two solenoid-arc generating devices are installed in the chamber to enable two tests to be run without disturbing the chamber. Observations of the effects of the intermittent arcing on the test material are made through a window in the chamber wall. On completion of the test, the material is removed from the chamber and subjected to detailed analysis.

Notes:

1. The tests can be varied by using different wire gages, ground metals and configurations, contact pressures, material distribution, and chamber atmospheres.
2. This Tech Brief is complete in itself. No additional information is available.

Patent status:

No patent action is contemplated by NASA.

Source: B. J. Hamlett and A. L. Krupski of
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